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Recruitment channel use and applicant arrival: An empirical analysis*

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Abstract. This paper focuses on the recruitment behaviour of firms at the extensive margin; we empirically explore the relationship between employer search strategies and the number of applicants by means of (reduced form) two-equations simultaneous models. The empirical analysis is carried out on a rich micro data set on Dutch employer recruitment behaviour.

Our empirical analysis reveals that the economic conditions prevailing on the labour market influence employer search activity at the extensive margin. In particular, we see that in tight (slack) labour markets characterised by excess demand (supply) of labour, the flow of applicants is smaller (larger). Employers react to the shortage (excess) of applicants by using more (less) often advertisements. This recruitment channel appears to trigger a significantly larger flow of applicants.

Key words: recruitment, labour demand

JEL classification: J63

1. Introduction

Because the match between a vacant position and a prospective employee is fraught with uncertainty, firms usually screen more than one applicant before tendering an employment offer. This is what Barron and Bishop (1985) define as the **extensive margin of search,** as opposed to the intensive margin of search, which pertains to the collection of information about single applicants.

Little is known about the search activities of firms at either margin. The

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interaction between labour market conditions, firm search channel use and number of applicants has seldom been analysed.

In this paper we aim to investigate two – thus far – unexplored issues regarding firms' search activities at the extensive margin: (i) how is firms' recruitment channel use influenced by the prevailing economic conditions on the labour market; and (ii) what is the impact of firm recruitment channel use on the number of applicants.

Barron et al. (1985) find that employers in the US spend on average eight hours per applicant during the interview and screening process; the number of interview hours increases for positions which require greater education (and skill) levels. Furthermore, an increase in the flow of applicants increases the number of interviewed applicants (before tendering a job offer), but it simultaneously reduces the hours spent per interview. Employers apparently exchange extensive search (the number of applicants) for intensive search (amount of information per applicant). The robustness of these results is stressed in Barron et al. (1997), where four different surveys (regarding the U.S.) are empirically analysed and contrasted with empirical results referring to the Dutch labour market (Van Ours and Ridder 1992; Van Ours 1989).

However, before the selection procedure can begin potential applicants have to be located and encouraged to apply. To this end, employers use recruitment channels to spread information to the eligible potential candidates about the characteristics of vacant positions. In this context, Van Ours and Ridder (1993) find that the use of advertisements increases the rate of arrival of applicants (which is nevertheless assumed to be constant throughout the application period).

The way in which employers choose recruitment channels has far-reaching theoretical implications in the relationship between labour markets and inequality. The choice of recruitment channel determines how job-related information will be distributed (the visibility of job-related information), which may in turn contribute to generate inequality (gender and race wage differential and segregation).

Firms can choose multiple recruitment channels to guarantee higher visibility of their vacancy/s among different strata of the population. Widespread search enable employers to gather a larger and more diversified pool of applicants and could thus ensure higher gains from search (Kirnan et al. 1989). Holzer (1996) investigates employer recruitment behaviour in the U.S. labour market, and in particular the relationship between type of skills sought and the recruitment channel used. The author finds that approximately one third of the firms in his analysis hired the most recently hired workers through newspaper advertisements. Advertisements are more likely to be used to hire workers in professional or managerial and clerical jobs.

Recruitment method use affects vacancy durations as well. Roper (1988) analyses vacancy duration in the British labour market conditional on the firm recruitment strategy. The author finds that the use of multiple recruitment methods leads to shorter vacancy durations, the use of advertisements increases vacancy durations, whereas the use of informal recruitment methods tends to shorten it[1] (see also Gorter et al. 1996; Russo et al. 1995).

[1] Barron et al. (1997) found that vacancy duration in the U.S. is on average shorter than one month. The vacancy duration lengthens as the amount of training increases and as educational requirements increase. Comparable results are found for the Dutch labour market by Russo et al. (1995).

The number of applicants screened, the type of applicants hired, and the vacancy duration all depend on how employers search for candidates. The way employers search for potential candidates is contingent upon the general economic conditions prevailing on the labour market at the time of search. Burdett and Cunningham (1998) conclude similarly.

Herein, we set out to investigate employer search activities at the extensive margin and analyse how the search is influenced by the labour market conditions that firms encounter during the recruitment process. To this end, we explore the interaction between the choice of the recruitment channels and the number of applicants generated. We also isolate recruitment channel specific effects on the rate of arrival of applicants. The analysis is novel in that we exploit the heretofore generally neglected time dimension in our data in order to investigate the impact of changes in labour market conditions on employer recruitment behaviour.

Our results indicate that the economic conditions prevailing on the labour market do indeed influence employer search activity at the extensive margin. In particular, we have seen that, in tight (slack) labour markets characterised by excess demand (supply) of labour, the flow of applicants is smaller (larger). Employers react to the shortage (excess) of applicants by making more (less) often use of advertisements; the recruitment channel that seems to generate the highest inflow of applicants.

The structure of the paper is as follows: we presents the relationship between recruitment channels use, applicants' arrival rate and vacancy duration in section 2. Section 3 describes our data set, and section 4 presents the empirical analysis. We conclude in section 5.

2. Recruitment channels, applicant arrival, and vacancy duration

Quits, lay-offs, and fluctuations in product demand are all events which imply that firms must often readjust their employment levels. Since the recruitment of new employees is a time consuming activity, firms may experience job vacancies during their adjustment process. Due to the uncertainty intrinsic to the recruitment process job vacancies arise, because applicants are difficult to locate and their productivity is not easily assessed (as outlined in Lippman and McCall 1976).

Firms can search for new employees in a variety of ways by choosing one or more recruitment channels, but they will select the combination which is most efficient. Rees (1966) classifies recruitment channels into two broad categories: formal and informal. Formal recruitment channels include: advertisements, public and private employment agencies, school recruitment (milk-rounds). Informal recruitment channels are open applications, the use of friends and relatives, and employee referrals. Informal search channels use social networks to spread job-related information.

Firms maximize profits on a per-period basis by choosing the optimal search strategy, which is comprised of an optimal reservation level of productivity and choice of the recruitment channel(s).

The selection of recruitment channel results from the comparison of expected costs and expected benefits (Marsden and Campbell 1990; Holzer 1996). The expected benefits deriving from the use of recruitment channels hinges on the fact that recruitment channels reach different types of candidates

(types of applicants differ in their productivity distribution); on the fact that recruitment channels generate different flows of applicants (generally the larger the flow the higher the probability of finding a good candidate), and on the fact that different recruitment channels provide potential candidates with different job-related information (applicants use this information to form their job expectations, job expectations may differ in degree of reliability, according to which recruitment channel has conveyed the relevant information).

Advertisements are expensive due to direct advertisement costs as well as indirect extensive screening costs. However, advertisements can attract many applicants and are often very effective in matching employed job seekers (Russo et al. 1997).

Conversely, the use of the public employment office as a recruitment channel is often costless (e.g. in the Netherlands), but personnel managers often complain that applicants are of poor quality and they lack motivation (Van Ours 1994). Barron and Mellow (1982) argue that the public employment service is not popular with employers because the applicants generated by this recruitment method are less likely to accept a job offer, and so the screening costs per vacancy rise.

Informal recruitment channels are considered to be highly effective (Lindeboom et al. 1994). The effectiveness stems from the fact that employers and employees exchange important and reliable information about each other (Simon and Warner 1992). Friends and relatives provide accurate information regarding working conditions and job demand (Montgomery 1991). This enables the prospective employee to form reliable expectations about the new job which are less likely to be disproved once hired (Granovetter 1995). The provision of reliable information reduces turnover and increases the value of the match. Incumbent workers also are likely to refer people of the same type and this tendency eases the screening procedure (productivity assessment, see Leicht and Marx 1997).

Williams et al. (1993) find that formal and informal recruitment channels reach variously qualified applicants in terms of experience and education. In a similar manner, informal recruitment channels produce higher levels of prehire knowledge. However, even if the informal channel is virtually costless, personnel managers sometimes complain about the low number of applicants it generates (Mencken and Winfield 1998).

Screening applicants induces costs; to avoid unnecessary screening, employers would prefer to elicit applications from only the most suitable candidates (Windolf 1986). As a consequence, recruitment channels thought to reach only low productivity candidates may remain unused although the cost of such channels is virtually null.

We see from our aforementioned synopsis that employee search involves costs and therefore lowers the present value of the stream of profit, but search is also a productive activity in that it increases the possibility of attracting applicants in the future. Firms may search across various recruitment channels, each of which can be characterised by applicant arrival rate, cost of use, separation probability, and applicant probability distribution (see Fallick 1992).

The optimal search strategy remains the same unless firms experience a change in the labour market conditions. Even if the optimal search strategy fails to provide a suitable candidate within a given period, the same search strategy will be enacted once again (provided that the labour market con-

ditions have not changed) in the subsequent period. Osberg (1993) argues that the job search methods used by job seekers vary in their effectiveness as conditions change on the labour market. In the same vein, if conditions on the labour market change, the employer search strategy should change as well. For example, an excess supply of labour is generally associated with an increase in the applicant arrival rate. In addition, job seekers compete with each other for scarce jobs; this process drives down their reservation wage, and recruitment becomes easier.

However another tendency needs to be considered. Excess demand of labour usually influences the applicant productivity distribution (on-the-job search is procyclical, see Tobin 1972; Burgess 1993). The low applicant arrival rate induces firms to compete against each other for scarce workers so job seekers consequently receive more job offers. Greater numbers of job offers rises their reservation wage, recruitment becomes difficult and vacancy durations lengthen.

Employer optimal search strategies should change accordingly. *Ceteris paribus*, when the flow of applicants is low, employers switch to recruitment channels characterised by a relatively large applicant arrival rate, even if these recruitment channels are fairly expensive. Conversely, when the applicant arrival rate is high, every recruitment channel tends to generate a sufficient number of applicants; in these situations employers may opt for less expensive recruitment channels[2].

In a reduced form model, the probability of filling a vacancy can be broken down into two components, the probability of contact with an applicant and the probability that an applicant is acceptable (i.e., the probability that the applicant's productivity is higher than the reservation level of productivity). Firm recruitment channel use (RCU, recruitment channels used during recruitment), will affect both the probability of a contact and the acceptance probability, and it consequently affects the completed vacancy duration (T). The realised vacancy duration also depends on the total number of applicants that have been considered during the recruitment process.

In turn, the total vacancy duration does influence the total number of applicants arrived, (denoted by TA). Hence we have:

$$\begin{aligned} T &= T(TA, RCU) \\ TA &= TA(T, RCU) \end{aligned} \tag{1}$$

Equation (1) clearly shows the mutual dependence between the total number of applicants (TA) and the completed vacancy duration (T)[3]. Next, we model the number of applicants and the vacancy duration as joint processes.

[2] Marsden and Campbell (1990) emphasises that recruitment channel productivity depends on job seeker search channel use. This line of reasoning requires a two-sided modelling that is beyond the scope of this paper.

[3] Note that the total number of applicants (TA) can be written as follows:

$$TA = \int_0^T RATEAPP(s)\, ds$$

where $RATEAPP$ is the per-period applicant arrival rate, and T is the realised vacancy duration.

3. The data set

The empirical analysis is based on the survey "How do firms recruit?" conducted among approximately 20,000 Dutch firms on behalf of the Dutch Ministry of Social Affairs.

A randomly selected sample of firms is interviewed by telephone every two months (the sample therefore does not have a panel structure). We used data for the year 1991–1994 which include detailed information on 19,806 firms (47,404 filled vacancies).

In the survey employers were asked about specific aspects of recruitment, such as which recruitment channels are used, how many job applications are received, what is the vacancy duration, what are the vacancy and firm-specific characteristics (sector, number of employees). The data set does not contain information on wages, recruitment costs or timing in both the arrival of applicants and the activation of additional recruitment channels. Recruitment channels are classified into the following ten categories: internal recruitment (among incumbent personnel), employee referral (via incumbent personnel), friends and relatives (of the recruiter; external acquaintances), open applications, advertisements, temporary work agencies, public employment office, school recruitment, private employment agencies (headhunters), and a residual method "others", which includes recruitment from training and internship programs.

The data refer to four years; 1991 and 1992 are years of a tight labour market, while 1993 and 1994 are years of a slack labour market. We used the ratio of total vacancies to total employment as a measure of labour demand condition on regional labour markets (the 12 administrative provinces in the Netherlands). The regional unemployment rate served as a measure of labour supply conditions.

Additional information on the data can be found in Appendix A, where one can see that the average vacancy duration is approximately five weeks (Barron et al. 1997 find a similar duration for vacancies in the U.S.).

Some descriptive statistics are presented in Table 1 to give an idea of the order of magnitude of the relationship among selected variables. Before proceeding any further, the following remarks are in order: (i) the average number of vacancies posted is higher when more recruitment channels are opened; (ii) the average duration of the recruitment procedure appears to be longer when more recruitment channels are used; (iii) advertisements provide a remarkably larger flow of applicants compared to the remaining recruitment channels; (iv) the pools of applicants are often quite small, the median number of applicants is seldom larger than four; and (v) informal recruitment methods appear to generate fewer applicants and to lead to a shorter vacancy duration.

The average number of recruitment channels used is quite low, 1.26[4]; 15,221 firms used only one recruitment channel (77% of the sample) and have filled 32,207 vacancies. On the contrary, only 4,585 (23%) firms used more than one recruitment channel; these firms filled 13,474 vacancies.

[4] In the survey held in 1986 the average vacancy duration is five weeks, while the average number of recruitment channels activated (per firm) is 1.98. Recruitment strategies have apparently not changed (the average vacancy durations in 1986 and during the period 1991–1994 are not significantly different), but the lower number of recruitment channels activated in more recent years suggests that, over time, employer recruitment attitudes have changed somehow (Russo et al. 2000).

There is no indication of a systematic relationship between the duration of the recruitment procedure and the number of vacancies posted (correlation coefficient $r = -0.01$, not significant at 5%). There appears moreover to be a positive relationship between the number of applicants and the number of vacancies posted (correlation coefficient $r = 0.29$, significant at 5%). The number of recruitment methods used positively correlates both with the number of vacancies posted ($r = 0.13$, significant at 5%) and with the vacancy duration ($r = 0.11$, significant at 5%).

Labour market conditions also appear to affect the recruitment process, albeit weakly. We find that the (regional) unemployment rate negatively correlates with the number of vacancies posted, the number of recruitment channels activated, and the vacancy duration (correlation coefficients $r = -0.03$, $r = -0.03$, $r = -0.06$, respectively; all significant at 5%). On the other hand, the number of vacancies posted, the number of recruitment channels used, and the vacancy duration correlate positively with the vacancy rate (correlation coefficients $r = 0.06$, $r = 0.06$, $r = 0.06$, respectively; all of them significant at 5%).

Insofar as employer search at the extensive margin is concerned, we find that the number of applicants positively correlates with the number of different recruitment channels activated and negatively correlates with the vacancy rate ($r = 0.06$, $r = -0.02$, respectively; both are significant at 5%).

We reach the conclusion that the number of recruitment channels used tends to affect vacancy duration and the number of applicants in the same direction[5].

4. The empirical analysis: recruitment channel use and applicant arrival rate

Firms' search activities during the recruitment process first result into a number of applicants for the vacant position(s) (TA). Next, to account for the fact that the number of applicants and the vacancy duration result from related processes, the two processes are modelled jointly. The bivariate reduced form model then assumes the following form:

$$\begin{aligned} LNTA &= \pi_1 X + \varepsilon_1 \\ LNT &= \pi_2 X + \varepsilon_2 \end{aligned} \tag{2}$$

where $LNTA$ is the logarithm of the number of applicants ($LNTA = \ln(TA)$), LNT is the logarithm of the vacancy duration ($LNT = \ln(T)$)[6], π_1 and π_2 are the reduced form parameters to be estimated, X is the set of regressors used to control for observed heterogeneity. From the discussion in the previous three sections, it follows that typical candidates for X are the educational (and ex-

[5] Barron et al. (1985) argue that as the extensive margin of search increases, the intensive margin decreases. The substitution can be accomplished by switching from an intensive information-oriented recruitment channel (such as the informal channel; see Montgomery 1991) to a quantity-oriented recruitment channel (as advertisements seem to be).

[6] The data represent a flow sample of filled vacancies with no censoring. In this case OLS gives unbiased but inefficient parameter estimates (Lancaster 1991). The results obtained here are comparable with an earlier duration analysis performed on the same data in Russo et al. (1995).

Table 1. Recruitment channel use, vacancy duration, and number of applicants

	AMONG INCUMBENT PERSONNEL				VIA INCUMBENT PERSONNEL				EXTERNAL ACQUAINTANCES			
	more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
# of Recruitment Channels	1.522	1.000	1.000	1.000	1.565	1.000	1.000	1.000	1.430	1.000	1.000	1.000
# of Applicants	12.419	4.000	5.543	3.000	8.243	3.000	3.799	2.000	6.631	2.000	3.515	2.000
Vacancy Duration	36.512	28.000	31.094	21.000	31.277	14.000	23.740	14.000	40.269	21.000	36.801	20.000
# of Vacancies	2.429	1.000	1.920	1.000	2.401	1.000	1.818	1.000	1.757	1.000	1.373	1.000
# Observations	1827	1827	1220	1220	1518	1518	1008	1008	1459	1459	1058	1058
	OPEN APPLICATIONS				ADVERTISEMENTS				TEMPORARY WORK AGENCIES			
	more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channels	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
# of Recruitment Channels	1.325	1.000	1.000	1.000	1.420	1.000	1.000	1.000	1.597	1.000	1.000	1.000
# of Applicants	10.168	3.000	7.637	3.000	31.778	15.000	33.006	15.000	11.622	4.000	5.870	3.000
Vacancy Duration	25.833	14.000	22.058	14.000	43.794	30.000	40.992	30.000	33.651	14.000	25.833	14.000
# of Vacancies	3.060	1.000	2.474	1.000	2.907	1.000	2.435	1.000	2.491	1.000	1.914	1.000
# Observations	2851	2851	2270	2270	7285	7285	5077	5077	2415	2415	1488	1488

	PUBLIC EMPLOYMENT SERVICE				SCHOOL RECRUITMENT				PRIVATE EMPLOYMENT AGENCIES			
	more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
# of Recruitment Channels	1.693	1.000	1.000	1.000	1.549	1.000	1.000	1.000	1.898	2.000	1.000	1.000
# of Applicants	14.605	6.000	8.332	5.000	8.512	3.000	5.240	2.000	14.268	4.000	13.315	4.000
Vacancy Duration	35.310	21.000	27.364	14.000	43.008	21.000	35.339	21.000	51.463	30.000	59.242	45.000
# of Vacancies	2.723	1.000	1.939	1.000	2.637	1.000	1.707	1.000	2.065	1.000	1.510	1.000
# Observations	3829	3829	1989	1989	728	728	508	508	1403	1403	524	524

	OTHER				THE WHOLE SAMPLE			
	more recruitment channels		1 recruitment channel		more recruitment channels		1 recruitment channel	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
# of Recruitment Channels	2.227	2.000	1.000	1.000	2.291	2.000	1.000	1.000
# of Applicants	12.294	3.000	17.354	4.000	20.719	8.000	15.474	5.000
Vacancy Duration	38.769	21.000	39.949	21.000	43.839	30.000	33.112	21.000
# of Vacancies	2.779	1.000	2.975	1.000	3.486	2.000	2.116	1.000
# Observations	761	761	79	79	3865	3865	15221	79

perience) requirements and the regional unemployment and vacancy rates. Furthermore, the existing empirical literature on vacancy duration and firms' search behaviour suggests that additional candidates could be: the number of workers sought, the type of job (permanent/temporary), the number of working hours involved (full-time/part-time), and the size of the firm. Industry differences are captured by dummies. Cyclical and seasonal differences are controlled for by using yearly and bimonthly dummies. The error terms – ε_1 and ε_2 – are jointly distributed according to a bivariate normal distribution. Common assumptions are: $E(\varepsilon_1) = E(\varepsilon_2) = 0$, $\mathrm{Var}(\varepsilon_1) = \sigma_1$, and $\mathrm{Var}(\varepsilon_2) = \sigma_2$, whereas the covariance between ε_1 and ε_2 is allowed to be non-zero. Given the joint distribution of the error terms in the two equations, we can estimate the model by means of maximum likelihood[7]. The results are presented in Table 2.

We have estimated two versions of each regression; the first is a benchmark model (without the effect of recruitment channel use, RCU); the second includes the recruitment channels among the regressors (as in Roper 1988; Simon and Warner 1992; and Holzer 1996). The comparison between the parameter estimates in Model I and Model II shows that a substantial part of the effect of the independent variables is mediated by the activation of recruitment channels. This result parallels nicely with the results of other empirical analyses on recruitment channel choice, i.e. Russo et al. (1995) and Gorter et al. (1996). After controlling for the recruitment channel use, the coefficient referring to the vacancy rate turns negative and significant. In other words, in a tight labour market the number of applicants decreases. The strong interaction between recruitment channels activation and labour demand conditions implies that employers do change their search strategies in response to different labour market conditions so that, on average, the number of arrived job seekers does not change over the business cycle. This is achieved by switching to advertisements which provide a much larger flow of applicants during periods of excess demand for labour.

However, an excess of labour supply (high unemployment) is not associated with a large number of applicants but instead tends to reduce the vacancy duration. This is consistent with the notion that high unemployment tends to reduce job seekers' reservation wages.

Vacancies requiring high educational standards also appear to attract a larger number of applicants, but the vacancy durations lengthen as well.

Sectoral patterns also appeared; all industries (except transport) tend to receive significantly fewer applicants compared to the business service industry which could be indicative of a supply-side phenomenon. The diminishing percentage of employment in the industrial sector (including manufacturing, agriculture, mining, and energy industries) may have induced job seekers to look for employment opportunities in the business service industry (which is, in fact, growing). A supply-side effect (the increased labour force participation of women) is also likely to account for the positive coefficient of the yearly dummies in the regression regarding the number of applicants.

The positive effect of the number of posted vacancies on the applicant arrival rate may be due to the higher success probability perceived by job

[7] In order to implement the likelihood function, we have made the following decomposition: $f(a,b) = f(a|b)^* f(b)$. If f is bivariate normal, the conditional distribution is again normal with mean $\mu_a + (\rho\sigma_a/\sigma_b)(b - \mu_b)$ and variance $\sigma_a^2(1 - \rho)$ (see Mood et al. 1974; Maddala 1983).

seekers. But 16% of the effect found in the benchmark model is spurious since it is due to the correlation between the number of vacant positions posted and the choice of recruitment channel/s. The elasticity of the number of applicants with respect to the number of posted vacancies is 0.656. A 10% increase in the number of posted vacancies generates, on average, a 6.56% increase in the number of applicants. In addition, the elasticity of the vacancy duration to the number of posted vacancies is not significantly different from zero. That is, an increase in the number of posted vacancies does not significantly change the length of the recruitment procedure. It thus appears, that the pooling of vacancies leads to efficiency gains in recruitment; the positive effect on duration found in the benchmark model is entirely due to differences in recruitment methods.

The positive sign of the coefficient regarding the firm size on the number of applicants may originate from the higher wages paid by large firms (the likelihood of finding better qualified applicants of higher quality is also higher; see Barron and Bishop 1985; and Oi 1993). Firms with more employees can exploit a larger social network and can therefore use the informal channels more effectively (see, for example Montgomery 1991).

The introduction of the recruitment channels has a larger impact on the parameter estimates of the number of applicants sub-model than on those of the vacancy duration sub-model. For example, the introduction of the recruitment channels reduces the size of the parameters referring to educational requirements in the benchmark model referring to the number of applicants (vacancy duration) as follows: secondary vocational about 28% (9.6%), secondary general 13.4% (4%), and university high vocational 27.2% (13.8%). The magnitude of the impact of the inclusion of the recruitment channels used on the parameters of the number of applicants sub-model is clearly larger than the impact on the parameters of the vacancy duration sub-model.

Furthermore, the use of informal recruitment channels generates a smaller number of applicants than formal recruitment channels do whereas informal channels seem to have a smaller impact on the vacancy duration than formal channels.

Conversely, the temporary placement agency appears to be a very efficient recruitment channel, because it generates fewer applicants and is associated with shorter vacancy durations.

Vacancy duration and applicant arrivals are positively correlated processes[8].

Next, in order to assess the impact of the use of multiple recruitment channels, we follow the approach of Roper (1988) and break down the estimated error components from Models I and II according to the first recruitment channel activated and to the total number of recruitment channels used. The results are shown in Table 3.

[8] To account for differences in the length of the recruitment process, one could weight the dependent variable (the number of applicants) by the vacancy duration; the time dimension would be re-scaled and one would implicitly assume a constant daily rate of arrival of applicants (TA/T). The effect of the exogenous variables on the thus constructed applicant arrival rate can be obtained by subtracting the value of the parameters obtained from the vacancy duration regression from the estimate obtained from the number of applicants regression. The results are presented in Table B1 in Appendix B and are nicely in line with the estimates in Van Ours and Ridder (1993).

Table 2. Vacancy duration and the number of applicants

Dependent Variable:	Model I: Benchmark Model				Model II: Full Model			
	$LNTA = \ln(TA)$ log(# applicants)		$LNT = \ln(T)$ log(duration)		$LNTA = \ln(TA)$ log(# applicants)		$LNT = \ln(T)$ log(duration)	
Ind. Var.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Log(Number of Vacancies)	0.778	0.013*	0.052	0.013*	0.656	0.011*	−0.018	0.013
Vacancy Rate	0.441	0.394	0.640	0.405	−1.033	0.331*	−0.113	0.390
Unemployment Rate	−0.017	0.008*	−0.025	0.008*	−0.002	0.007	−0.020	0.008*
MONTHS								
March–April	0.156	0.029*	0.028	0.030	0.136	0.024*	0.024	0.029
May–June	0.099	0.030*	0.005	0.030	0.123	0.025*	0.017	0.029
July–August	0.030	0.029	−0.033	0.030	0.061	0.025*	−0.023	0.029
September–October	0.114	0.029*	0.029	0.029	0.157	0.024*	0.038	0.028
November–December	0.148	0.031*	0.028	0.031	0.183	0.026*	0.046	0.030
YEARS								
1992	0.085	0.032*	−0.034	0.033	0.085	0.027*	−0.051	0.031
1993	0.181	0.042*	−0.061	0.043	0.231	0.035*	−0.047	0.041
1994	0.144	0.038*	−0.189	0.039*	0.255	0.032*	−0.147	0.038*
SIZE								
Large	0.446	0.020*	0.297	0.020*	0.437	0.017*	0.325	0.020*
Medium	0.200	0.025*	0.157	0.026*	0.189	0.021*	0.174	0.025*
INDUSTRY								
Transportation	−0.056	0.036	−0.167	0.037*	0.033	0.031	−0.096	0.036*
Construction	−0.476	0.032*	−0.238	0.033*	−0.380	0.027*	−0.203	0.032*
Personal Services	−0.191	0.022*	0.015	0.022	−0.194	0.018*	0.001	0.021
Manufacturing	−0.380	0.025*	0.013	0.025	−0.336	0.021*	0.034	0.025
EDUCATION								
Primary Vocational	0.081	0.028*	0.309	0.028*	0.083	0.023*	0.304	0.027*
Secondary Vocational	0.397	0.031*	0.686	0.032*	0.286	0.026*	0.620	0.031*
Secondary General	0.454	0.045*	0.592	0.046*	0.393	0.038*	0.568	0.045*
University, High Vocational	0.629	0.034*	1.053	0.035*	0.458	0.028*	0.908	0.034*

TYPE OF VACANCY										
Age Limits	0.325	0.020*		0.138	0.021*	0.230	0.017*		0.096	0.020*
Experience	0.068	0.019*		0.123	0.019*	0.023	0.016		0.092	0.018*
Permanent	0.254	0.020*		0.348	0.020*	0.090	0.017*		0.274	0.020*
Full-Time	0.156	0.023*		0.171	0.023*	0.125	0.019*		0.167	0.023*
RECRUITMENT CHANNELS										
Among Incumbent Personnel	–	–		–	–	−0.166	0.025*		0.198	0.030*
Via Incumbent Personnel	–	–		–	–	−0.283	0.027*		0.058	0.032
Exernal Acquaintances	–	–		–	–	−0.340	0.028*		0.211	0.033*
Open Applications	–	–		–	–	−0.181	0.023*		−0.070	0.027*
Advertisements	–	–		–	–	1.169	0.018*		0.647	0.021*
Temporary Work Agencies	–	–		–	–	−0.151	0.023*		−0.132	0.027*
Public Emplyment Service	–	–		–	–	0.189	0.019*		0.301	0.022*
School Recruitment	–	–		–	–	−0.255	0.037*		0.209	0.044*
Private Employment Agencies	–	–		–	–	0.096	0.034*		0.496	0.040*
Other	–	–		–	–	−0.288	0.044*		−0.273	0.052*
Constant	0.529	0.097*		1.888	0.099*	0.453	0.082*		1.709	0.097*
Variance	1.131	0.006*		1.164	0.006*	0.948	0.005*		1.118	0.006*
		Coeff.	Std. Err.				Coeff.	Std. Err.		
Correlation		0.229	0.007*				0.124	0.007*		
Number of Observations			19,086					19,086		
Log Likelihood			−58,892.684					−55,126.479		
LR Test			7,479.200*					18,742.020*		

*: significant at 5%

The reference group of the variables are given in parenthesis: Years (1991), Months (January–February), Industry (Business Services), Education (Primary), Full-Time (Part-Time), Permanent (Temporary), Experience (No Experience), Age Limits (no Age Limits), Size (Small).

Table 3. Vacancy duration, applicants arrival rate and the use of multiple recruitment channels

The figures represents the average estimated error components in the cell. The figure in parenthesis gives the number of cases

MODEL I: Benchmark model, recruitment channel use not included

Number of applicants First Recruitment Method	Number of recruitment channels used 1	2	3	4	more than 4	Vacancy duration First Recruitment Method	Number of recruitment channels used 1	2	3	4	more than 4
Among Incumbent Personnel	−0.705 (1,220)	0.216 (320)	0.565 (115)	0.876 (35)	0.802 (16)	Among Incumbent Personnel	−0.169 (1,220)	0.315 (320)	0.360 (115)	0.411 (35)	0.562 (16)
Via Incumbent Personnel	−0.738 (1,008)	0.100 (176)	0.669 (56)	0.425 (12)	0.898 (3)	Via Incumbent Personnel	−0.297 (1,008)	−0.048 (176)	0.195 (56)	0.489 (12)	1.656 (3)
Exernal Acquaintances	−0.838 (1,058)	−0.174 (83)	−0.059 (17)	0.663 (2)	0.893 (1)	Exernal Acquaintances	−0.165 (1,058)	0.260 (83)	0.410 (17)	0.195 (2)	0.721 (1)
Open Applications	−0.516 (2,270)	0.110 (190)	0.174 (36)	−0.227 (10)	−0.095 (2)	Open Applications	−0.427 (2,270)	0.039 (190)	−0.086 (36)	0.682 (10)	0.581 (2)
Advertisements	0.848 (5,077)	0.573 (693)	0.385 (134)	0.515 (24)	0.553 (13)	Advertisements	0.283 (5,077)	0.419 (693)	0.560 (134)	0.783 (24)	0.929 (13)
Temporary Work Agencies	−0.609 (1,488)	0.198 (281)	0.313 (64)	0.248 (14)	0.091 (5)	Temporary Work Agencies	−0.541 (1,488)	−0.036 (281)	0.232 (64)	−0.112 (14)	0.748 (5)
Public Emplyment Service	−0.027 (1,989)	0.366 (663)	0.262 (162)	−0.104 (18)	0.259 (11)	Public Emplyment Service	0.026 (1,989)	0.342 (663)	0.519 (162)	0.738 (18)	0.891 (11)
School Recruitment	−0.580 (508)	−0.152 (63)	−0.414 (7)	−0.002 (3)	– –	School Recruitment	−0.156 (508)	0.312 (63)	0.615 (7)	−0.668 (3)	– –
Private Employment Agencies	−0.330 (480)	0.210 (52)	0.038 (17)	– –	0.405 (1)	Private Employment Agencies	0.284 (480)	0.540 (52)	0.670 (17)	– –	1.328 (1)
Other	−0.264 (123)	−0.596 (500)	0.118 (50)	0.400 (13)	0.884 (3)	Other	−0.267 (123)	−0.190 (500)	0.153 (50)	0.585 (13)	0.854 (3)
Total (19,086)	−0.053 (15,221)	0.163 (3,021)	0.343 (658)	0.412 (131)	0.541 (55)	Total (19,086)	−0.062 (15,221)	0.192 (3,021)	0.385 (658)	0.485 (131)	0.825 (55)

MODEL II: Full model, recruitment channel use included

Number of applicants First Recruitment Method	Number of recruitment channels used 1	2	3	4	more than 4	Vacancy duration First Recruitment Method	Number of recruitment channels used 1	2	3	4	more than 4
Among Incumbent Personnel	−0.150	0.249	0.410	0.383	0.640	Among Incumbent Personnel	−0.017	0.131	−0.037	−0.204	−0.302
	(1,220)	(320)	(115)	(35)	(16)		(1,220)	(320)	(115)	(35)	(16)
Via Incumbent Personnel	−0.139	0.437	0.587	0.263	0.735	Via Incumbent Personnel	−0.031	−0.043	−0.093	0.071	0.703
	(1,008)	(176)	(56)	(12)	(3)		(1,008)	(176)	(56)	(12)	(3)
Exernal Acquaintances	−0.115	0.132	0.300	0.832	0.747	Exernal Acquaintances	−0.027	0.095	0.140	−0.337	0.501
	(1,058)	(83)	(17)	(2)	(1)		(1,058)	(83)	(17)	(2)	(1)
Open Applications	−0.049	0.214	0.106	−0.226	0.676	Open Applications	−0.039	0.121	−0.180	0.457	0.392
	(2,270)	(190)	(36)	(10)	(2)		(2,270)	(190)	(36)	(10)	(2)
Advertisements	0.092	−0.222	−0.322	−0.150	0.175	Advertisements	0.020	−0.019	0.050	0.149	0.083
	(5,077)	(693)	(134)	(24)	(13)		(5,077)	(693)	(134)	(24)	(13)
Temporary Work Agencies	−0.063	0.220	−0.051	0.048	−0.372	Temporary Work Agencies	−0.084	0.062	0.022	−0.424	−0.010
	(1,488)	(281)	(64)	(14)	(5)		(1,488)	(281)	(64)	(14)	(5)
Public Emplyment Service	0.079	−0.147	−0.305	−0.746	0.079	Public Emplyment Service	0.042	−0.009	0.060	0.159	0.140
	(1,989)	(663)	(162)	(18)	(11)		(1,989)	(663)	(162)	(18)	(11)
School Recruitment	−0.007	−0.034	−0.165	−0.573	–	School Recruitment	−0.051	0.118	0.393	−1.283	–
	(508)	(63)	(7)	(3)	–		(508)	(63)	(7)	(3)	–
Private Employment Agencies	0.086	−0.127	−0.349	–	−0.220	Private Employment Agencies	0.207	0.012	−0.034	–	0.363
	(480)	(52)	(17)	–	(1)		(480)	(52)	(17)	–	(1)
Other	0.405	−0.166	0.134	0.324	0.467	Other	0.130	−0.101	−0.104	0.190	0.009
	(123)	(500)	(50)	(13)	(3)		(123)	(500)	(50)	(13)	(3)
Total	−0.004	0.024	0.011	0.016	0.309	Total	−0.001	0.007	0.002	−0.025	0.028
(19,086)	(15,221)	(3,021)	(658)	(131)	(55)	(19,086)	(15,221)	(3,021)	(658)	(131)	(55)

In contrast to the findings in Roper (1988) for the U.K. labour market, we discover that the use of more recruitment channels is generally associated with a longer vacancy duration and to larger flows of applicants. This suggests that employers in tight labour markets use multiple recruitment channels to compensate for the lack of candidates. The exception regards the use of advertisements; placing advertisements jointly with the activation of auxiliary recruitment channels tends to result in a lower number of applicants and in a longer vacancy duration. This could be associated with the presence of recruitment difficulties (see Van Ommeren and Russo 1997).

Because our focus is on firms' search practices at the extensive margin, and since the use of advertisements seems to generate a substantially higher number of applicants[9], we want to isolate advertisement-specific effects on the number of applicants.

We have therefore adopted a switching regression model, estimated in the same way suggested in Maddala (1983)[10]. We distinguish between two regimes (advrt, o), the first of which characterises the use of advertisements as the recruitment channel (denoted by advrt); the second (denoted by o) characterises the use of any of the remaining recruitment channels. The criterion function (I_i) determines which of the states is applicable. The model reads as follows:

$$\begin{aligned} LNTA_{advrt} &= X\beta_{advrt} + u_{advrt} \\ LNTA_o &= X\beta_o + u_o \\ I^* &= X\alpha + \zeta \end{aligned} \tag{3}$$

where $LNTA$ is the logarithm of the number of applicants, β and α are the parameters to be estimated, X is the set of regressors, u and ζ are the error terms (correlated). So if $I^* > 0$ (or equivalently $\alpha X > -\zeta$), the firm considered activates advertisements (Advertisements = 1). If ζ is distributed according to a normal distribution, it is easy to recognise in the third line of equation (3) a probit model, and consequently $\text{Var}(\zeta)$ is fixed at 1. The estimation procedure adopted here is the two-step procedure (see Maddala 1983, pp. 223–228). In the first step we obtain the maximum likelihood estimates of the parameters of the probit model $(\hat{\alpha})$, and then we calculate the Mills ratio $W1 = \phi(\hat{\alpha}X)/\Phi(\hat{\alpha}X)$, and $Wo = \phi(\hat{\alpha}X)/[1 - \Phi(\hat{\alpha}X)]$ (ϕ is the Normal density function, and Φ is the corresponding cumulative distribution function).

In the second step we estimate the following model:

$$\begin{aligned} LNTA_{advrt,i} &= X_{advrt,i}\beta_{advrt} - \lambda_{u_{advrt},\zeta} W1_i + v_{advrt,i} \\ LNTA_{o,i} &= X_{o,i}\beta_o + \lambda_{u_0,\zeta} Wo_i + v_{o,i} \end{aligned} \tag{4}$$

[9] The predicted value of the number of applicants at the sample average is 3.8. This value drops to 3.2 when advertisements are not used. The use of advertisements raises the predicted number of applicants to 12.1 applicants (an increment of about 9 applicants).

[10] Notice that since no exclusion restriction is theoretically defendable, the same set of regressors is used both in the criterion function (the equation for the activation of the recruitment channel) and in the applicant arrival rate equations (under the two regimes). This is a rather ad hoc procedure however. The model remains identified because of the non-linearity in the criterion function (probit model). As Lee (1996, p 91) has pointed out, in this case the Mills ratios can no longer be considered as pure "selectivity" effects, since they may also be capturing the effect of misspecification in the second stage regressions.

and hence obtain estimates of $\beta_{\text{advrt}}, \beta_o$, λ's (λ indicates the correlation between the error components in the two regimes – u_{advrt} and u_o – and ζ)[11].

The estimates of the switching regression model are presented in Table 4.

The estimates of the probit model indicate that advertisements are more likely to be used when greater numbers of vacancies have to be filled, during periods of a tight labour market, for positions requiring high educational standards and working experience, and when permanent positions must be filled. On the contrary, advertisements are less likely to be used during periods of a slack labour market (thus supporting the argument in Marsden and Campbell 1990).

The estimates of the coefficients of the Mills ratios (λ) in the two regimes give additional insights into the employer search at the extensive margin (Green 1993).

The coefficients of the Mills ratios in the two regimes are both positive, but the coefficient of the selectivity correction in regime 1 (Advertisements = 1) is only weakly significant (at 10%). The sign of the coefficients of the selectivity correction give rise to the following interpretations: employers who use advertisements are better than average at searching at the extensive margin in either regime, but they are relatively better at searching at the extensive margin via advertisements (since they want more applicants). Employers choosing the alternative regime are less good than average at searching at the extensive margin, but they are relatively better at searching via the alternative regime than via advertisements (as they prefer having fewer applicants).

To quantify the importance of the selectivity correction terms, we have also evaluated the switching regression model at the sample average. The results are presented in Table 5.

It can be seen that the selectivity correction accounts for an increase of about 165% of the inflow of applicants in regime 1 (advertisements) and for a drop of about 29% of the inflow of applicants in regime 2 (any of the remaining recruitment channels). However, one should be careful in interpreting these results as pure selectivity effects (Lee 1996, and Footnote 8). On average, because of their deliberate choice of advertisements, employers receive nine more applicants. Conversely, employers who deliberately choose for any of the remaining recruitment channels receive, on average, about one less applicant.

5. Conclusions

In this paper we have empirically explored employer search activities at the extensive margin. To this end we have used unique micro data on the recruitment behaviour of Dutch firms. The data have a time dimension which enables

[11] The error terms v in equation (4) are heteroscedastic, in addition, W1 and Wo are predicted values. Hence, the standard errors obtained from applying OLS are incorrect. To overcome this problem we should have implemented the correction procedure (for the standard errors) proposed in Maddala (1983). The procedure itself appeared to be over-demanding in terms of computational time for the full data set; thus we have implemented it for 1000, 2000, and 3000 randomly selected observations. The discrepancies between the standard errors obtained from OLS and the correct ones were negligible (in the third decimal digits). We therefore report here the OLS standard errors.

Table 4. Switching regression model

Models	Probit		Regime 1 OLS		Regime 0 OLS	
Depependent Variable:	ADVRT		$LNTA = \ln(TA)$|ADVRT = 1		$LNTA = \ln(TA)$|ADVRT = 0	
Ind. Var.	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Log(Number of Vacancies)	0.286	0.015*	0.687	0.107*	0.917	0.044*
Vacancy Rate	3.484	0.454*	0.877	1.429	1.042	0.651
Unemployment Rate	−0.038	0.009*	−0.016	0.021	−0.014	0.008
MONTHS						
March–April	0.034	0.034	0.137	0.046*	0.160	0.028*
May–June	−0.051	0.034	0.038	0.050	0.131	0.028*
July–August	−0.067	0.034	−0.015	0.052	0.040	0.029
September–October	−0.103	0.033*	0.111	0.059	0.104	0.030*
November–December	−0.083	0.036*	0.250	0.057*	0.080	0.031*
YEARS						
1992	0.004	0.036	0.144	0.045*	0.021	0.031
1993	−0.080	0.048	0.408	0.070*	0.048	0.042
1994	−0.236	0.045*	0.425	0.111*	−0.003	0.050
SIZE						
Large	0.014	0.029	0.153	0.040	0.210	0.023*
Medium	0.021	0.023	0.399	0.032*	0.452	0.019*
INDUSTRY						
Transportation	−0.014	0.025	−0.362	0.032*	−0.071	0.021*
Construction	−0.243	0.038*	−0.706	0.108*	−0.401	0.044*
Personal Services	−0.192	0.044*	−0.095	0.098	−0.050	0.041
Manufacturing	−0.083	0.029*	−0.572	0.048*	−0.271	0.026*
EDUCATION						
Primary Vocational	0.038	0.034	−0.136	0.049*	−0.062	0.026*
Secondary Vocational	0.185	0.047*	0.756	0.095*	0.152	0.046*
Secondary General	0.287	0.026*	0.553	0.115*	0.187	0.046*
University, High Vocational	0.410	0.031*	0.915	0.162*	0.285	0.063*

TYPE of VACANCY						
Age Limits	0.107	0.022*	0.110	0.050*	0.047	0.023*
Experience	0.160	0.023*	0.328	0.066*	0.302	0.031*
Permanent	0.403	0.024*	0.361	0.164*	0.182	0.057*
Full-Time	0.063	0.027*	0.232	0.045*	0.095	0.023*
W1	–	–	1.064	0.580	–	–
W2	–	–	–	–	−0.604	0.269*
Constant	−1.005	0.112*	0.034	0.859	0.623	0.110*
Number of Observations		19,806		7,285		11,801
Log Likelihood		−11,708.796	R squared	0.274		0.368
LR Test		1,962.480*	F-Test	105.280*		263.110*

*: significant at 5%

The reference group of the variables are given in parenthesis: Years (1991), Months (January–February), Industry (Business Services), Education (Primary), Full-Time (Part-Time), Permanent (Temporary), Experience (No Experience), Age Limits (no Age Limits), Size (Small).

Table 5. The evaluation of the effect of the self selection at the sample averages

	Regime 1 Advertisements = 1	Regime 2 Advertisements = 0
In logs		
Predicted Number of Applicants (n)	1.702	1.558
Selectivity Correction	0.975	−0.342
Resulting Number of Applicants	2.677	1.216
In absolute numbers		
Predicted Number of Applicants (n)	5.485	4.749
Selectivity Correction	9.056	−1.375
Resulting Number of Applicants	14.541	3.374

us to investigate the effect of changing labour market conditions on employer recruitment strategies.

Our empirical analyses show that firms that pool similar vacancies appear to enjoy efficiency gains in recruitment, and that the use of multiple recruitment channels is associated with a higher number of applicants and with longer vacancy durations. The only exception occurs when employers begin the recruitment process by using advertisements. In this case the use of multiple recruitment channels is associated with fewer applicants but still with longer vacancy durations. More specifically, the *ceteris paribus* effect of the use of advertisements leads to about nine additional applicants. A switching regression model produces an almost identical estimate. The effect of the use of advertisements on the number of applicants is therefore quite robust.

Furthermore, employers tend to adopt different recruitment strategies during slack and tight labour markets, in so doing they are able to counterbalance cyclical variations in the applicant arrival rate. During periods of excess demand when job seekers become scarce, employers are more likely to prefer advertisements, because this recruitment channel generates a substantially higher applicant arrival rate. On the contrary, during slack labour markets where the applicant arrival rate is larger, employers tend to use recruitment channels other than advertisements. Without accounting for the effect of the change in employer search behaviour over the cycle, the number of applicants appears to be stable over time, even when prevailing economic conditions change. Our results reveal that the use of recruitment channels and the applicant arrival rate are positively correlated processes and that employer search activities at the extensive margin are heavily influenced by the economic conditions prevailing on the labour market in which firms are operating.

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Appendix A: The data

Table A1. Variable list

Variable Name	Description
RCU	recruitment channels used
T	vacancy duration, in days.
LNT	$\ln(T)$
$NUMVAC$	number of identical vacancies posted.
$LNUMV$	$\ln(NUMVAC)$.
TA	number of applicants.
$LNTA$	$\ln(TA)$.
LRATEAPP	$\ln(TA/T)$.
YEAR 1991–1994	year of the survey.
MONTH	semester of the survey; 1 January–February; 2 March–April; 3 May–June; 4 July–August; 5 September–October; 6 November–December.
Manufacturing	dummy variable =1 if firms operate in one of the following industries: Agriculture [ISIC 1], Mining [ISIC 2], Manufacturing [ISIC 3], Utilities [ISIC 4].
Business Services	dummy variable =1 if firms operate in one of the following industries: Business services (Finance and insurance and real estate and business services) [ISIC 8], Restaurant and hotels and trade [ISIC 6].
Personal Services	dummy variable =1 if firms operate in the following industry: Community and social and personal services [ISIC 9].
Construction	dummy variable =1 if firms operate in the following industry: Construction [ISIC 5].
Transportation	dummy variable =1 if firms operate in the following industry: Transport and communication [ISIC 7].
Primary	dummy variable =1 if Minimal educational level required is primary general.
Primary Vocational	dummy variable =1 if Minimal educational level required is primary vocational.
Secondary General	dummy variable =1 if Minimal educational level required is secondary general.
Secondary Vocational	dummy variable =1 if Minimal educational level required is secondary vocational.
University, High Vocational	dummy variable =1 if Minimal educational level required is university of comparable vocational level.
Size	number of employees at the plant.
Large	dummy variable =1 if Size $>$ 99.
Medium	dummy variable =1 if 49 $<$ Size $<$ 100.
Small	dummy variable =1 if Size $<$ 50.

Table A1 (*continued*)

Variable Name	Description
Experience	dummy variable =1 if working experience was required.
Age Limits	dummy variable =1 if an age limit was imposed.
Full-Time	dummy variable =1 if hiring regarded full-time position/s (more than 30 hours per week).
Permanent	dummy variable =1 if hiring regarded permanent position/s.
Vacancy Rate	vacancy rate (total vacancies/total employment) in the administrative province where the plant is located.
Unemployment Rate	unemployment rate in the administrative province where the plant is located.
Among Incumbent Personnel	dummy variable =1 if firms search among incumbent personnel.
Via Incumbent Personnel	dummy variable =1 if firms search via incumbent personnel.
External Acquaintances	dummy variable =1 if firms search via external acquaintances.
Open Applications	dummy variable =1 if firms received open applications.
Advertisements	dummy variable =1 if firms advertised the vacancies.
Temporary Work Agencies	dummy variable =1 if firms used temporary work agencies.
Public Employment Service	dummy variable =1 if firms used public employment service.
School Recruitment	dummy variable =1 if firms recruited from schools.
Private Employment Agencies	dummy variable =1 if firms used commercial recruitment firms (Head-Hunters).
Other	dummy variable =1 if firms used other recruitment channels.

Table A2. Descriptive statistics

Variable	Mean	Std. Dev.	Median
T	35.29	50.66	21
TA	16.54	39.00	5
NUMVAC	2.39	4.34	1
LNUMV	0.47	0.72	0
LRATEAPP	−1.13	1.55	−1.10
LNT	2.91	1.26	3.05
LNTA	1.77	1.33	1.61
Vacancy Rate	0.09	0.04	0.08
Unemployment Rate	6.22	1.55	5.70
March–April	0.17	0.38	0
May–June	0.16	0.37	0
July–August	0.17	0.37	0
September–October	0.20	0.40	0
November–December	0.14	0.35	0
1992	0.27	0.45	0
1993	0.23	0.42	0
1994	0.24	0.43	0
Large	0.40	0.49	0
Medium	0.15	0.35	0
Primary	0.11	0.31	0
Secondary General	0.05	0.22	0
Secondary Vocational	0.27	0.44	0
University, High Vocational	0.20	0.40	0
Construction	0.09	0.29	0
Transportation	0.06	0.24	0
Personal Services	0.26	0.44	0
Manufacturing	0.17	0.38	0

Table A2 (*continued*)

Variable	Mean	Std. Dev.	Median
Age Limits	0.22	0.41	0
Experience	0.64	0.48	1
Permanent	0.74	0.43	1
Full-Time	0.80	0.39	1
Among Incumbent Personnel	0.09	0.29	0
Via Incumbent Personnel	0.08	0.27	0
External Acquaintances	0.08	0.27	0
Open Applications	0.15	0.36	0
Advertisements	0.38	0.49	0
Temporary Work Agencies	0.13	0.33	0
Public Employment Service	0.20	0.40	0
School Recruitment	0.04	0.19	0
Private Employment Agencies	0.07	0.26	0
Other	0.04	0.20	0
Number of observations: 19,086			

Appendix B: The Applicant arrival rate

Table B1. The rate of arrival of applicants (assumed to be constant during the recruitment process)

Dependent Variable:	$LN(TA/T)$ [log(number of applicants per day)]			
Ind. Var.	Coef.	Std. Err	Coef.	Std. Err
Log(Number of Vacancies)	0.725	0.016*	0.674	0.016*
Vacancy Rate	−0.183	0.496	−0.905	0.479
Unemployment Rate	0.008	0.010	0.019	0.009*
MONTHS				
March–April	0.127	0.037*	0.112	0.035*
May–June	0.092	0.037*	0.104	0.036*
July–August	0.061	0.037	0.083	0.036*
September–October	0.085	0.036*	0.119	0.035*
November–December	0.119	0.039*	0.135	0.037*
YEARS				
1992	0.121	0.040*	0.138	0.039*
1993	0.240	0.053*	0.276	0.051*
1994	0.331	0.048*	0.399	0.047*
SIZE				
Large	0.147	0.025*	0.111	0.024*
Medium	0.042	0.031	0.014	0.030
INDUSTRY				
Transportation	0.225	0.036*	0.216	0.035*
Construction	0.082	0.051	0.038	0.049
Personal Services	−0.069	0.029*	−0.120	0.028*
Manufacturing	−0.203	0.033*	−0.236	0.033*
EDUCATION				
Primary Vocational	−0.242	0.040*	−0.180	0.039*
Secondary Vocational	0.109	0.046*	0.126	0.044*
Secondary General	−0.207	0.027*	−0.195	0.026*
University, High Vocational	−0.396	0.031*	−0.372	0.030*

Table B1 (*continued*)

Dependent Variable:	$LN(TA/T)$ [log(number of applicants per day)]			
Ind. Var.	Coef.	Std. Err	Coef.	Std. Err
TYPE of VACANCY				
Age Limits	0.186	0.026*	0.132	0.025*
Experience	−0.055	0.023*	−0.069	0.023*
Permanent	−0.094	0.025*	−0.183	0.024*
Full-Time	−0.016	0.029	−0.042	0.028
RECRUITMENT CHANNELS				
Among Incumbent Personnel	–	–	−0.365	0.037*
Via Incumbent Personnel	–	–	−0.340	0.039*
Exernal Acquaintances	–	–	−0.551	0.041*
Open Applications	–	–	−0.112	0.033*
Advertisements	–	–	0.521	0.026*
Temporary Work Agencies	–	–	−0.019	0.033
Public Emplyment Service	–	–	−0.112	0.027*
School Recruitment	–	–	−0.465	0.054*
Private Employment Agencies	–	–	−0.396	0.050*
Other	–	–	−0.020	0.064
Constant	−1.578	0.120*	−1.467	0.117*
Number of Observations		19,086		19,806
R2		0.156		0.216
F-test		140.68*		150*
*: significant at 5%				

The reference group of the variables are given in parenthesis: Years (1991), Months (January–February), Industry (Business Services), Education (Primary), Full-Time (Part-Time), Permanent (Temporary), Experience (No Experience), Age Limits (no Age Limits), Size (Small).